ICM University of Warsaw

Seminar on
Nonlinear Mathematical Analysis with Applications
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Information on Lectures

(ICM,UW, 5 floor, Pawinskiego 5a, Warsaw)

June 5, 2017: 14:00 - 14:45

Prof. Noriaki Yamazaki (Kanagawa Univ., Japan)

Title: Singular optimal control problems for doubly nonlinear evolution equations governed by time-dependent

Abstract: We discuss a new class of doubly nonlinear evolution equations governed by time- dependent subdifferentials. Let H be a real Hilbert space and V be a uniformly convex Banach space such that V is dense in H and the injection from V into H is compact. Also we suppose that the dual space V* of V is uniformly convex. Then, we consider the following abstract nonlinear evolution equations governed by double time-dependent subdifferentials in the Banach space V*:

$$(\mathrm{P})\ \begin{cases} \partial_*\psi^t(u'(t)) + \partial_*\varphi^t(u(t)) + g(t,u(t)) \ni f(t) \ \text{ in } V^* \ \text{ for a.e. } t \in (0,T), \\ u(0) = u_0 \ \text{ in } V, \end{cases}$$

where $0 < T < \infty$, $u' = du/dt$ in V, $\psi^t : V \to \mathbb{R} \cup \{\infty\}$ and $\varphi^t : V \to \mathbb{R} \cup \{\infty\}$ are time-dependent proper, l.s.c. (lower semi-continuous) and convex functions on V for each $t \in [0,T]$, $\partial_*\psi^t$ and $\partial_*\varphi^t$ are their subdifferentials from V into V^*, $g(t,\cdot)$ is a single-valued operator from V into V^*, f is a given V^*-valued function and $u_0 \in V$ is a given initial datum. Suppose that $\partial_*\varphi^t$ is single-valued, linear and continuous from V into V^*.

In this talk, we discuss the abstract existence result of solutions to (P). Note that a counterexample for uniqueness of solutions to (P) was given in [1;Section 4]. Therefore, we investigate the singular optimal control problem characterized by not well-posed state system (P). Moreover, we establish the approximating method to consider the singular optimal control problem for (P).

This is a joint work with Nobuyuki Kenmochi (ICM, University of Warsaw, Warsaw, Poland) and Ken Shirakawa (Chiba University, Chiba, Japan).

References

[1] N. Kenmochi, K. Shirakawa and N. Yamazaki, New class of doubly nonlinear evolution equations governed by time-dependent subdifferentials, *Solvability, Regularity, Optimal Control of Boundary Value Problems for PDEs*, Springer INdAM Series, (to appear).

[2] N. Kenmochi, K. Shirakawa and N. Yamazaki, Singular optimal control problems for doubly nonlinear quasi-variational evolution equations governed by time-dependent subdifferentials, (preprint).